UNIVERSITÉ DE PAU ET DES PAYS DE L'ADOUR	**THESIS ALLOWANCE OFFER**
	DOCTORAL SCHOOL OF « SCIENCES EXACTES ET LEURS APPLICATIONS - ED 211 » Avenue de l'université, BP 1155, 64 013 PAU Cedex – France

THESIS SUBJECT

Laboratory:

laboratoire des Sciences de l'Ingénieur Appliquées à la Mécanique et au génie Électrique (SIAME) – EA 4581

TITLE :

Experimental study of the fire behaviour of low-carbon concrete

ABSTRACT:

This thesis proposal is part of the LOCCFIRE research project funded by the ANR (Agence Nationale de la Recherche). It involves four partners: SIAME at the University of Pau and Pays de l'Adour, I2M at the University of Bordeaux, LMDC at INSA Toulouse and the Centre Scientifique et Technique du Bâtiment.

The main objectives of the project are to fill gaps in the understanding and modelling of the fire behaviour of low-carbon binder-based concretes and, more specifically, combinations of traditional constituents (fly ash, silica fume, blast furnace slag, metakaolin, calcareous and siliceous mineral additions) in unusual proportions.

This experimental thesis will include, in particular:

- A technical and scientific state-of-the-art
- Tests to characterise the thermo-hygro-mechanical properties from ambient temperature to high temperatures (800 °C)
- Complex tests that will be used to validate the numerical simulations carried out in partner laboratories
- Small- and medium-scale fire tests

Key words: low-carbon concrete, experiments, thermo-hygro-mechanical properties, fire behaviour

CONDITIONS D'EXERCICE

Laboratory:

laboratoire des Sciences de l'Ingénieur Appliquées à la Mécanique et au génie Électrique (SIAME) – EA 4581

Website:	**siame.univ-pau.fr**	
Supervisor:	**Hélène Carré (UPPA)**	
Co-supervisors:	**Christian La Borderie (UPPA), Vincent Trincal (UPPA)**	
Locations :	**Anglet (France)**	
Beginning date :	**january 2026**	**Duration: 36 months**
Employer:	**Université de Pau et des Pays de l'Adour (UPPA)**	
Monthly gross salary:	**€ 2200**	

KNOW-HOW OF THE LABORATORIES

- Formulation of concrete and earth-based materials
- Rheological, thermal, mechanical and microstructural characterisation of structural materials
- Development of test devices and instrumentation
- Behaviour of building materials (cementitious materials and raw earth) at high temperatures

MISSION – MAIN ACTIVITIES

One of the main challenges currently facing concrete construction is limiting its environmental impact.

One solution is to reduce the carbon footprint associated with cement production. Solutions already exist, with the availability on the market of standardised cements with a much lower clinker content than the most commonly used conventional cements (CEMI or II/A). However, their use in construction projects may still encounter technological barriers, including their fire behaviour. In fact, very few studies have been done to date on the fire behaviour of concrete made from these innovative binders. The aim of the LOCCFIRE project is therefore to contribute to a better understanding of the fire behaviour of concrete made from low-carbon cements.

The binders targeted in the project will be manufactured from traditional components used in the cement industry (fly ash, silica fume, slag, metakaolin, limestone and silica additives). The research strategy is based on a dialogue between experimentation and simulation at different scales to ensure that the phenomena induced by high temperatures are correctly observed and quantified.

Work will therefore be carried out at the microstructure scale to characterise the high-temperature behaviour of the hydrates formed. Numerous small-, medium- and large-scale tests will be carried out. In parallel with the experimental campaign, numerical simulations will also be carried out on several scales, with the aim of explaining the experimental results obtained and also of developing tools to help in predicting the behaviour of these innovative concretes in fire situations.

The LOCCFIRE project involves four partners: SIAME at the University of Pau and Pays de l'Adour, I2M at the University of Bordeaux, LMDC at INSA Toulouse and the Scientific and Technical Centre for Building.

The main tasks to be carried out as part of the PhD programme covered by this offer are:

- State of the art
  Several topics will be addressed in this state of the art review, such as the normative and regulatory framework, research on high-temperature concrete behaviour, low-carbon binders and their behaviour at high temperatures.
- Characterisation tests
  These tests will enable both the analysis and understanding of the behaviour of the concretes studied at high temperatures and provide the data necessary for the numerical simulations carried out, in particular, in the LMDC and I2M laboratories.
- Complex tests
  These tests will be complex in terms of their configuration and/or instrumentation. Perfect control and knowledge of thermal, hydric and mechanical conditions will be sought. These tests will contribute to a better understanding of the behaviour of these concretes, but above all will provide useful data for the validation of the simulations carried out by the I2M laboratory.
- Fire tests
  Fire tests will be carried out as part of this phd on a small and medium scale. They will be heavily instrumented and will enable the risk of spalling of the concretes studied to be analysed in particular. They will also prepare the tests that will be carried out on a medium and large scale at the CSTB, an accredited fire testing centre.

REQUIRED SKILLS

The required skills are:

- Solid scientific initial training
- Good knowledge in materials science, mechanics and thermal engineering
- Good knowledge of concrete material
- Experience or taste for experimental work
- Good oral and written skills in English
- Proficiency in French appreciated

APPLICATION EVALUATION CRITERIA

Application processing: selection board

Candidates will be selected first on application file. An interview will be organized after the first phase of selection. The criteria for evaluating the application are:

- Adequacy of the skills acquired with those listed above
- Adequacy between the Master's degree (or equivalent) and the thesis subject
- Notes and rankings in Master (or equivalent) and regularity in the university curriculum
- Proficiency in English
- Ability of the candidate to present his or her work
- Work experience like a traineeship in laboratory or other; possibly, research works already carried out (reports, publications)

ESTABLISHMENT OF THE APPLICATION FORM, DEADLINE FOR DEPOSIT

Send by e-mail an application file including:

- Curriculum Vitae
- cover letter
- transcript of notes and rankings in Master (or equivalent)
- letters of recommendation
- contact details of the professionals (minimum two) to contact

DEADLINE FOR DEPOSIT: october 31, 2025

CONTACT

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